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FRONT COVER

Harvesting Rice in Japan

From sunup to sundown Japanese farmers work diligently to get the most possible out of their little fields. Even so they do not produce enough to feed all their countrymen, and 20 percent of Japan's food is imported. (Photo courtesy of U. S. Army.)

BACK COVER

Japan: Value of Total Agricultural Imports, 1952

Since 1946 Japan has been one of the most important foreign markets for the products of United States farms and the United States has been the largest single supplier of agricultural products needed by Japan. In 1952 the United States supplied 50 percent of the eight commodities shown on the chart and 37 percent of the value of total agricultural imports.

NEWS NOTES

Foreign Economic Program

"The national interest in the field of foreign economic policy is clear. It is to obtain, in a manner that is consistent with our national security and profitable and equitable for all, the highest possible level of trade and the most efficient use of capital and resources. That this would also strengthen our military allies adds urgency. Their strength is of critical importance to the security of our country."

With these words, President Eisenhower last month presented his "minimum" program on foreign economic policy to Congress. He said the United States must take the initiative in lowering the "uneconomic, man-made barriers" to mutual trade and the flow of funds. Among his recommendations were:

A 3-year extension of the Trade Agreements Act, including authority to (1) negotiate reductions of existing tariff rates on selected commodities by not more than 5 percent in each of 3 years; (2) reduce tariffs in effect on January 1, 1945, by not more than one-half over a 3-year period on products not being imported or which are being imported only in negligible volume; and (3) negotiate reductions of tariff rates in excess of 50 percent ad valorem or its equivalent to 50 percent ad valorem over a 3-year term.

The President also urged further simplification of customs procedures.

In conclusion, he emphasized that the foreign economic policy he recommended consists of four major and interdependent parts: Aid, which we wish to curtail; investment, which we wish to encourage; convertibility, which we wish to facilitate; and trade, which we wish to expand.

Credit for photos is given as follows: p. 83, Japan Travel Bureau; p. 95, J. Malcolm Orchard.

FOREIGN AGRICULTURE ALICE FRAY NELSON, EDITOR

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The Japanese Market for U.S. Agricultural Products

by **RILEY H. KIRBY***

Japan has since the war been one of our most important foreign customers for agricultural commodities. In 1952 it was our best customer, taking shipments valued at nearly $430 million.

Before the war, Japan took from the United States more than 1 million bales of cotton, but most of its large food imports were supplied by Korea, Manchuria, Formosa, and China. Since the war, trade with these areas has been largely suspended, and the United States has come to supply not only a large part of the Japanese food imports but also about the same proportion of Japan's cotton requirements as before the war. To a large extent this trade has been based on direct aid from the United States and special receipts in connection with the Korean War. With the cessation of the war and the decline in foreign aid, there are signs that Japan may have difficulty in maintaining the recent level of imports, especially from the United States and other dollar countries.

Agricultural Production

The population of Japan proper, 87,000,000 persons, is confined to an area of about 147,000 square miles. Only 15,000,000 acres—16 percent of the country—is farmed, however, because of difficult terrain and soil limitations. And large-scale machinery is little used because the nearly 6 million farms are small—they average 2.5 acres—and labor is abundant—43 percent of Japan's population is employed on farms. In other respects, however, Japanese agriculture is remarkably modern. Through intensive practices, yields are far higher than elsewhere in Asia and compare favorably with those of advanced countries of the West. About one-third of the cultivated area is double-cropped.

Dr. Kirby is Regional Economist, Asia and the Middle East Branch, FAS.

TABLE 1.—*Production of major crops in Japan, average 1931-40, annual 1949-53*

[In 1,000 short tons]

Crop	1931-40	1949	1950	1951	1952	1953
Grains:						
Rice (brown)	10,317	10,330	10,630	9,948	10,938	9,080
Wheat	1,404	1,435	1,475	1,642	1,695	1,514
Barley	1,782	2,198	2,160	2,391	2,379	2,305
Other	529	342	475	455	485	434
Total	14,032	14,305	14,740	14,436	15,497	13,333
Potatoes	5,636	7,328	9,846	8,932	9,612	8,386
Soybeans	358	247	364	523	575	460

Because of the need to produce a maximum of food, agriculture is devoted almost completely to the production of food crops. The cereal grains and potatoes occupy 70 percent of the planted area and, in terms of calories, account for an even higher proportion of the value of domestically produced food.

Rice alone occupies 40 percent of the planted area and contributes nearly one-half of the calories contained in the national output. In prewar years the average crop was about 10.3 million short tons of brown rice. In 1945 it was only 7.1 million as a result of disruption from war. Fortunately, production increased the following years to more than 10 million tons and by 1952 had reached a near-record level of 10.9 million tons. As a result of extremely unfavorable weather during this past growing season, however, the 1953 rice crop is reported at only 9.1 million tons.

Wheat and barley together account for about 15 percent of the calories represented by the national output. Production of both of these crops had declined sharply by the end of the war but is now significantly higher than during the 1930's.

White potatoes and sweetpotatoes were produced in the amount of 5 million tons during the 1930's. Since the war, production has exceeded 8 million, and potatoes have become a more impor-

* The author made extensive use of reports from the U. S. Embassy in Tokyo.

TABLE 2.—*Domestic food production in Japan in brown-rice equivalent, by categories, average 1931-40, annual 1952 and 1953*

[In 1,000 short tons]

Category	1931–40	1952	1953
Grains	13,512	14,881	12,753
Potatoes	1,478	2,617	2,256
Pulses	453	331	246
Soybeans	448	719	575
Vegetables and fruits	597	757	650
Dairy products and eggs	136	348	396
Meats	70	120	133
Marine products	881	1,541	1,541
Fats and oils	529	509	509
Sugar	32	60	55
Beverages		413	434
Miscellaneous	2	848	829
Total	18,138	23,144	20,377

TABLE 3.—*Food supply per capita per day, Japan, by categories, 1952-53*

Category	Calories	Protein
		Grams
Grains	1,484	31.2
Potatoes	110	1.7
Pulses	28	2.0
Soybeans and soybean products	76	7.3
Vegetables and fruits	72	2.3
Dairy products and eggs	25	1.6
Meats	7	1.1
Marine products	91	13.5
Fats and oils	39	
Sugar	119	.1
Beverages	37	.1
Total	2,088	60.9

tant item of diet. Other food items, taken singly, are relatively unimportant. As a group, however, they make up about 20 percent of the total food production.

Because of a sharp decline in the demand for silk, production is now only 27 million pounds—less than one-third of prewar. Exports of raw silk in the prewar period amounted to 65 million pounds annually and represented 15 percent of the value of total exports compared to 10 million pounds in recent years, representing less than 4 percent of the value of total exports.

Composition of Food Supply

Rice is of course the principal food in Japan, although Japanese are eating 20 percent less rice now than they did before the war and correspondingly more wheat and barley. Soybeans and fish are important foods, too, for they contribute substantially to meeting protein needs in a diet that normally contains very little animal proteins.

Average annual production of food in Japan proper during the decade 1931-40 has been estimated at 18.1 million short tons of brown-rice equivalent, and per capita food consumption variously estimated at 2,100 to 2,250 calories per day. In that period, imports made up about 15 percent of the food supply.

Now, however, food imports constitute 20 percent of the diet, and per capita consumption is only 2,100 calories per day. This situation is the result of the large increase in population since 1940, for agricultural production has made a striking recovery since the lean years immediately after the war, reaching an all-time high of 23.2 million tons, brown-rice equivalent, in 1952.

Production Possibilities

Further increases in food production will be difficult to achieve. Certainly the prospects for further expansion of acreage are practically nil. Land under cultivation has remained fairly constant since it reached 15 million acres in 1920; during the preceding 50 years it had increased by 4.5 million acres, stimulated by the rapid industrialization and population growth of that period. Without some revolutionary development in agricultural science, then, continued improvement in the already high crop yields will come more slowly and at higher cost.

For many years the Government has lent considerable support to agricultural research and extension activities designed to increase domestic production, and it has sponsored facilities for providing agricultural credit.

Another phase of Government policy that affects farm production is the fixing of the price of rice. A base price is established for a specified delivery quota, and incentive bonuses are paid for early delivery and over-quota delivery. Through 1951 the price to the consumer covered the cost to the Government for collection and handling. In 1952, however, there occurred a deficit of $20 million, and for the 1953 crop the subsidy is expected to be about $58 million.

TABLE 4.—*Major imports of agricultural commodities into Japan, total and from the United States, average 1930-34, annual 1949-53*

[In 1,000 short tons except as noted]

Commodity	Total						From United States				
	1930-34	1949	1950	1951	1952	1953	1949	1950	1951	1952	1953
Rice (milled)	1,885	144	740	983	1,099	1,165	1	56	46	301	176
Wheat	658	2,118	1,727	1,806	1,856	1,833	2,104	949	1,327	1,305	1,010
Barley	5	488	302	1,030	1,085	745	410	112	682	366	284
Soybeans	766	210	224	342	184	494	163	105	323	178	474
Sugar	940	267	450	610	874	(1)	(1)	(2)	6	20	(1)
Cotton [3]	3,298	875	1,546	1,750	1,980	2,130	656	1,269	822	956	641

[1] Not available.
[2] Less than 1,000 short tons.
[3] In 1,000 bales of 480 pounds.

Similar controls were set up for wheat and barley, but in June of 1952 controls were removed, and there have since been no compulsory deliveries and no rationing of these products, although the Government stands ready to buy at what are in effect support prices. All other food price controls were removed prior to 1952.

Trade in Agricultural Commodities

During the 1930's cereal grain imports were predominantly of rice, and the Japanese people were able to indulge their traditional preference for this staple to the extent of nearly 60 percent of their caloric intake. Since the war, rice has been much less readily available on the world market. Furthermore, because of the disruption of war, Japan has lacked the resources to purchase rice on the former scale. Consequently, imports have been much reduced, and rice consumption now provides only about 50 percent of caloric intake.

The decline in rice supplies has been largely offset by imports of wheat and barley, which now contribute about 20 percent of the caloric intake compared to 10 percent prewar. But there is still some consumer resistance to the use of these grains. The preference for rice and the special preference in Japan for short-grain rice are important considerations in planning food imports.

Rice. Today, as prewar, Japan is the world's largest importer of rice although the proportion of total trade going to Japan has declined from 20 percent to about 15 percent. During each of the past 2 years, imports have been slightly more than 1 million tons of milled rice. The preferred short-grain rice is imported to the extent of available supplies, and the remaining requirements are filled by imports of medium- and long-grain rice.

While rice from the United States tends to be high priced compared to that from other sources, Japan is eager to buy from the California crop, which is a Japanese variety and represents the major foreign source of high-quality short-grain rice. Furthermore, the Japanese traders find that, because of sound United States grading and trade practices, they can depend on receiving the grade they contract for. Japan also imports some rice produced in our Southern States, which is primarily medium- and long-grain, but for the most part that rice is not competitive in price with the medium- and long-grain supplies from Burma and Thailand.

In 1952 Japanese imports from the United States amounted to 300,000 tons—one-third of our total rice exports. In 1953 United States rice was under allocation in order to meet defense commitments in Korea, and Japan was able to buy only 176,000 tons. But export controls have been removed, and Japan hopes to buy as much as 400,000 tons from the United States in 1954.

With a rapidly increasing population and a continued consumer preference for rice, Japan will need to import larger quantities of rice in the future. So long as availability of foreign exchange permits, Japan will take California short-grain rice, even at premium prices. But, with present price differentials, Southern States rice will not likely figure largely in the medium- and long-grain imports.

Wheat. In the prewar period Japan's trade in wheat was quite insignificant. But, because of the short supply of rice since the war, Japan has become the fourth most important world importer, taking more than 1.8 million tons annually in recent years.

Some flour is imported but is only 1 percent in wheat equivalent of the total wheat imported.

The United States has shared significantly in this trade. For example, in both 1951 and 1952 Japan imported more than 1.3 million short tons from us. This was 70 percent of the total Japanese imports and 10 percent of the United States exports of wheat. A year ago imports of 1.7 million tons were planned for the Japanese fiscal year April 1953-March 1954, but this figure has now been revised upward to about 2.2 million tons because of the short harvest in 1953. Japan has a quota of 1.1 million tons for 1953-54 under the International Wheat Agreement. About 710,000 tons of this wheat is expected to come from the United States and 390,000 from Canada. In addition Japan has a trade agreement with Argentina to take about 330,000 tons under an open account arrangement; most of this wheat has already been purchased. And recently an agreement was concluded under which Japan will receive about 500,000 tons of wheat from the United States under Section 550 of the MSA Act. This arrangement permits payment in yen, thus saving foreign exchange—an attractive inducement for the months ahead when above-normal imports will be required to offset last year's poor crops. As for the remaining 270,000 tons of wheat, price will be the major factor in determining the source.

For the years immediately ahead, Japanese import requirements for wheat will likely stand at about 2 million tons. For the more distant future these needs will become greater as population increases, but the ratio of wheat to rice in the import picture is not expected to increase as long as the Japanese can afford rice.

Barley. Since World War II Japan has been a major market for barley entering into world trade. In 1951 imports rose to 1 million tons; 65 percent of this amount was procured from the United States, accounting for four-fifths of its barley exports. In 1952, although Japanese imports increased about 5 percent, the proportion supplied by the United States fell to one-third because of a poor crop. The lower level of imports in 1953, about 745,000 tons, reflects what appeared to be an oversupply resulting from heavy imports during the previous 2 years. However, as the magnitude of the food deficit arising from the poor 1953 crop year has become clearer, plans have been made for much larger imports in the coming year. Japan has an agreement with Australia to take from 100,000 to 200,000 tons and an agreement with the United States to take 100,000 tons under Section 550. Beyond this, the sources of barley for the coming year have yet to be determined and will depend on what terms of trade can be arranged.

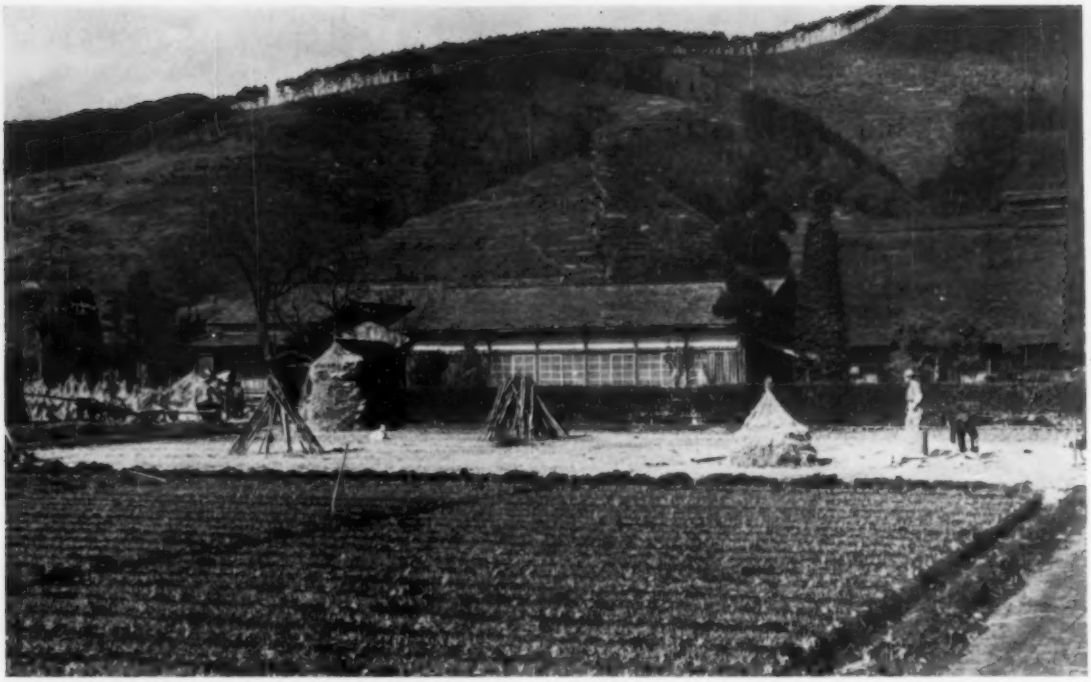
Soybeans. Japan's imports of soybeans in recent years have approached 300,000 tons, and it seems probable that they will continue so during the next few years. A large portion of these imports have been coming from the United States. There had been some dissatisfaction on the point of quality of United States soybeans, but that dissatisfaction has been softened to a certain extent.

Whether the United States can retain its present share of the Japanese market will depend on the relative prices and quality of beans available from other sources; Japan is making some effort to obtain supplies from Manchuria, a major source before the war. There is some feeling that if Japan could produce margarine from soybean oil at sufficiently low cost, the Japanese people might further increase their consumption of bread, thus expanding the markets for both wheat and soybeans. This, of course, is a long-term development and would not affect the present market.

Cotton. Since the beginning of industrialization in Japan, cotton has dominated imports and cotton textiles have dominated exports. In the 1930's Japan imported annually more than 3 million bales of raw cotton, about one-third from the United States. Immediately following the war, imports were less than 10 percent of prewar, but by 1952 had increased to 2 million bales. Imports from the United States increased to 1 million bales in 1951, but fell off to just over 600,000 bales in 1952 and 1953 because of price and other considerations.

The Japanese cotton textile industry has made a vigorous recovery since the war; the industry has been rebuilt to about 65 percent of its maximum prewar spindleage, and to a large extent modern machinery is being used. But whether prewar levels of production, and incidentally of raw cotton imports, will be reached will depend on the ability of the industry to market such output at home and abroad.

The home market has been good, although there has been some competition from synthetic fibers, but the markets abroad have been cut somewhat by restrictions imposed against imports of Japanese textiles by some of Japan's once large customers in Southeast Asia that are developing textile industries



Farmstead in the mountain range of Yamanashi Prefecture, Japan. Difficult terrain limits the cultivable land of Japan.

of their own and by parts of the sterling area. These restrictions have recently been alleviated to some extent as a result of the Anglo-Japanese trade treaty. And the dual price system that is in effect helps the industry meet competition in foreign markets.

The industry has suffered from inflation, which has not only weakened its financial structure but has also made its textiles somewhat less competitive on the world market.

On balance, it is expected that the cotton textile industry will continue at the present level during the next 2 or 3 years, but the longer run outlook is less clear. Imports of raw cotton in 1954 may run anywhere from 2.1 to 2.5 million bales. The share of this market that the United States may obtain will depend on the availability of dollars and relative prices, but it seems likely that the United States may continue to supply a large part of the Japanese cotton imports.

Balance of Payments

Japan is dependent on foreign areas for many basic raw materials for industry. It gets all its raw cotton, wool, bauxite, phosphate rock, and crude rubber from abroad, and relies heavily on imports for many other items such as iron ore, coking coal, crude oil, salt, zinc, and tin. Today, even more than prewar, raw materials and foodstuffs dominate Japanese imports, while exports consist primarily of manufactured goods.

In the prewar period, Japan's commodity exports paid for more than 90 percent of its commodity imports. The small debit balance was almost completely covered by net income from shipping services, foreign investments, and other invisible trade, so that the current international accounts were in near balance. Since the war the volume of Japanese foreign trade has not recovered to the former levels, and exports have lagged more than imports. Consequently, the value of exports ($1.3 billion in recent years) has been only 65 percent of the value of imports ($2 billion). Thus, to achieve a balance, a much greater burden has been placed upon invisible trade. Actually, with the destruction of two-thirds of the Japanese merchant fleet during the war and the loss of overseas investments, earnings from the usual items of invisible trade have been much too small to balance accounts. It is only by

virtue of special procurements by the United States in connection with the Korean War, amounting to $585 million in 1951 and $825 million in 1952, that Japan has been able to balance international accounts and show some net earnings. This situation is the source of concern to the Japanese Government since special procurements may be expected to decline as prospects for a settlement in Korea improve.

Japan will not easily increase exports and invisible trade in the near future. It has had difficulty in maintaining exports during the past 3 years. Accordingly, any sizable reduction in special dollar receipts may aggravate the problem of keeping up the current level of imports. Since the trade deficit (about $700 million a year) is greater with the dollar area than with sterling and open account countries, a decline in dollar receipts from special procurements would be more detrimental to dollar imports. And inasmuch as imports from the United States constitute 60 percent of all dollar imports, it is likely that this trade will suffer. Such a cutback could affect United States farmers, since two-thirds of Japan's imports from the United States consist of agricultural products.

It is felt that, in the immediate future, Japanese earnings may benefit through participation in the reconstruction of Korea. And, during the coming year, gold and dollar assets, estimated at $800 million at the end of 1953, will help to maintain dollar imports. If this should provide time for rationalization and modernization of Japanese industry, the competitive position of Japanese exports in world markets may be improved sufficiently to reduce the present trade deficit to a safer level. If, in expanding exports, trade follows the present pattern (only a third of total exports going to the dollar area) the additional earnings will be largely nondollar exchange. As long as world currencies remain relatively inconvertible, Japan may find difficulty in maintaining present levels of imports from dollar countries.

Outlook

Japan is about 80 percent self-sufficient in food. Agriculture is already intensive and scientific, and production increases will be difficult and costly to achieve. Yet, Japan will continue to need more food, for its population is growing by more than a million a year.

The outlook, then, is for progressively larger food imports. At the present dietary level, an additional 160,000 tons of food, brown-rice equivalent, will be required annually to feed the population increase.

Major food imports now are rice, wheat, barley, soybeans, and sugar; but changes in overall quantity and in the proportions of particular items may be expected with fluctuations in domestic production and relative availability and prices of world supplies.

As for cotton, Japan's present imports are only about two-thirds of prewar. With many of its prewar markets for cotton goods no longer available, the cotton textile industry will probably not recover to its former level of production. Consequently, imports of raw cotton in the immediate future are not expected to exceed 2½ million bales.

Thus far in the postwar period some Japanese industries have found it difficult to compete in the export markets. Yet export they must. Use of more modern machinery and techniques would help them reduce costs. With many of the prewar areas of trade now cut off, new markets must aggressively be sought out. And with increasing competition in the world textile markets, a broader diversification of Japanese industry may prove advantageous to the Japanese situation.

Japan will obtain supplies of agricultural products from many sources. Relative prices, always an important factor, will be complicated by the problem of inconvertible currencies and special trade arrangements. Continued large imports from the United States may be hampered by shortage of dollars in that Japanese exports go more largely to sterling and open account countries than to the dollar area. However, the countries of Southeast Asia, which now absorb more than 40 percent of the Japanese commodity exports, produce for export many raw materials required by the United States. It is conceivable that if, in the future, world currencies become convertible, multilateral trading patterns may be developed that will help overcome the difficulty of dollar shortage. Potentially, at least, Japan will remain a major world import market for agricultural products. If United States farm commodities can be offered at competitive prices, they should continue to supply a substantial share of the Japanese requirements.

Interchangeability Among Fats and Oils*

The United States, as a principal supplier to the world fats and oils market, is keenly interested in any process that broadens the competition in that market. Such a process is hydrogenation.

Since the commercial application of hydrogenation to oils and fats in the first decade of the present century, all fats and oils have become directly or indirectly competitive with one another. This fact has had far-reaching implications. For example, hydrogenation has made whale oil usable as a major ingredient of margarine and of soap and so has opened up a new source of supply of fats and oils for both food and non-food uses. Also, by making liquid vegetable oils usable as ingredients of margarine and shortening, hydrogenation has contributed to a great expansion in the manufacture of these products and to the development of a massive demand for oilseeds. This in turn has induced a great increase in production of Manchurian soybeans and West African groundnuts, and also, in recent years, American soybeans. Exports of soybeans from Manchuria and groundnuts from West Africa have been major factors in the economic development of these areas. Interchangeability of fats and oils tends to tie their prices together in international markets, and to make producers of oil crops in one part of the world susceptible to developments in a far distant region. For example, the export demand for United States soybeans, cottonseed oil, and lard is affected by variations in the olive crop in Mediterranean countries, in the groundnut crops in India and West Africa, in the coconut production in the Far East, and in the whale catch in the Antarctic.

In most industrialized countries, refined oils such as groundnut, cottonseed, and sunflower come close to being perfect substitutes for each other, both for use as cooking and salad oils and as ingredients of margarine. Thus they come into competition with butter.

At the other extreme, however, the competition between tung oil and butter is indirect and slight in degree, through the following chain of substitutions: linseed oil can substantially replace tung oil in varnishes and enamels if tung oil becomes too high in price; soybean oil can be used instead of linseed oil in certain kinds of paint and in linoleum, if linseed oil becomes too dear; but soybean oil when hydrogenated is a principal ingredient of margarine, which competes with butter. Fats and oils in their natural form—i.e. crude or refined, but before hydrogenation or other chemical modification—can be classified into several categories, with a high degree of interchangeability among the items within each category and a lesser degree between categories.

A few salient facts about the chemistry of fats and oils are useful in understanding interchangeability. Chemically fats and oils are the result of a union of glycerol (known commercially as glycerine) and fatty acids. Fatty acids consist mainly of a long chain of carbon atoms attended by hydrogen atoms. For each fatty acid, there is a specific number of carbon atoms in the chain. Fatty acids may be divided into two major categories: saturated and unsaturated. In saturated fatty acids, all the possible positions available for hydrogen atoms are occupied, but in unsaturated fatty acids, one or more of these positions are vacant. Fats with a relatively high ratio of saturated to unsaturated fatty acids are solid at ordinary temperatures in the Temperate Zone; fats with a predominance of unsaturated fatty acids, however, are liquid at these temperatures.[1]

*Reprinted from *Monthly Bulletin of Agricultural Economics and Statistics, FAO*, December 1953.

[1] Fatty acids are not present in the fat molecule in their original form but in a slightly modified form, properly called fatty acid radicals. To avoid the introduction of additional chemical terms in the article, we say loosely that fats and oils contain fatty acids when strictly speaking we should say fatty acid radicals.

Types of Fats and Oils

. Liquid edible vegetable oils, often called "soft" oils, form the most numerous category of fats. Into this category fall olive, sesame, groundnut, cottonseed, sunflower seed, and maize-germ oils, as well as several others. These oils have a high proportion of two unsaturated fatty acids, oleic and linoleic, in their chemical structure. Soybean and rapeseed oils are soft oils from the standpoint of utilization, but they differ from the other oils of the group in their chemical constitution.

In industrialized countries, large-scale methods are used to extract oil from oilseeds. Relying on the application of heat and pressure, these methods produce crude oils which contain disagreeable flavors and odors, and which must therefore be refined and deodorized for edible purposes. Usually these oils are also bleached to a pale color. Since lack of flavor and color represents high quality in oils produced by large-scale methods, consumers of liquid oils in industrialized countries have acquired a preference for bland, pale oils. Under these conditions the kind of oilseed used as a source makes relatively little difference; price is a major factor in competition among most soft oils in industrialized countries since oils of this class are highly interchangeable.

Where oilseed processing is still done on a small scale in local mills of traditional types, oilseeds are not subjected to high heat or pressure, and the crude oil from the first pressing is usually edible without any further treatment. In countries where this kind of processing is common, consumers usually prefer oil which contains flavor and color carried over from the seed. Large quantities of high-quality crude olive oil are produced in the Mediterranean countries and usually command a price premium over other liquid oils. There is a considerable volume of international trade in this type of oil, mainly from Mediterranean countries to countries in the Western Hemisphere where people from the Mediterranean area have settled in large numbers.

"Drying" oils form another important category of liquid fats. These oils are even less unsaturated than the soft oils. On exposure to light and air, drying oils form a waterproof film of varying degrees of toughness and hardness, depending on the oil used and the way it has been prepared. These oils are used mainly for paints, varnishes, and linoleum.

Cottonseed oil flows from a press in Texas. Hydrogenation gives this oil a wide market but at the same time brings it into competition with other oils from many sources.

Linseed oil, the outstanding drying oil, contains a high proportion of linoleic acid and linolenic acid. Tung, oiticica, and some other oils contain unusual kinds of unsaturated fatty acids which impart very rapid drying properties. Soybean oil lies between drying and soft oils in its properties and is used mainly in food products but also in paints, varnishes, and linoleum.

A third category of liquid oils is constituted by whale and fish oils. These contain an unusually wide variety of fatty acids, including a rather large proportion of unsaturated acids. In their natural form, these oils are used mainly for oilcloth, special types of paints, various other industrial products, and as low-priced fats for soap. Most whale oil is not used in its natural form but is hydrogenated for use in edible products and as a better grade soap fat.

Owing to the presence of a fatty acid peculiar to itself, castor oil stands alone in a separate category. Castor oil has many industrial and military applications. Since the late 1930's, substantial quantities of castor oil have been used to make a drying oil similar to tung oil, by means of a chemical process called dehydration.

Oil from rapeseed and other seeds of the *Brassica* family also stands alone, from the chemist's point of view, because of the presence of a peculiar fatty acid. Rapeseed oil is especially well adapted for use in the manufacture of lubricants. In Asia and Europe, however, rapeseed is used mainly as a liquid edible oil and competes with the soft oils group.

Among hard fats a leading category consists of coconut oil and other oils extracted from various palm seeds. The peculiarity of these oils is the presence of a high proportion of lauric acid, one of the saturated fatty acids. Lauric-acid oils have several special properties and uses. Contrary to most fats, they have a rather well-defined melting point, at around 25° C. Lauric-acid oils contribute quick lathering properties to soap in which they are used. They have special uses in biscuit and confectionery manufacture. The lauric acid obtainable from them is in increasing demand from the chemical industries.

A second important group of solid fats is composed of lard, greases, tallow, and palm oil. These fats, like the soft oils, contain oleic and linoleic acids, but in a considerably smaller proportion. Conversely, the proportion of saturated fatty acids (mostly stearic and palmitic) is higher than in the soft oils, though smaller than in the lauric-acid group. Lard and greases are softer in consistency than tallow; palm oil is intermediate in this respect but is closer to tallow than to lard or greases.

Tallow may be edible or inedible, depending on the tissues from which it is rendered and the care with which it is produced. Greases are inedible fats. The United States accounts for most of the world output of greases. Inedible tallow and greases are mainly used for soap; palm oil also found its main outlet in soap before the war, but now more probably goes into food uses than into soap. Large quantities of inedible tallow and greases in the United States are used to produce fatty acids as raw materials for the chemical industries.

Lard, used almost entirely for food, also makes an excellent soap fat, but only exceptionally does its price drop low enough to bring it into competition with greases.

Fats made from milk constitute another large category of fats. In the temperate zone, this kind of fat reaches the consumer in the form of butter, which is an emulsion of water in fat. In India and other hot countries, pure milk fat, ghee, is prepared; at high temperatures, ghee keeps better than butter. The natural fats most closely resembling butter in plasticity and melting point are the lauric-acid oils and certain other vegetable oils knows as "vegetable butters." Among the natural animal fats, lard is closest to butter in its physical properties but has a considerably higher melting point. Vegetable butters form only a minor part of the oils and fats picture. The most important are cocoa butter, which is used almost exclusively in the confectionery trade, and shea butter, which is used mainly as a soap fat.

History of Interchangeability

Substitution Among Natural Fats. In discussing interchangeability, we shall not go back to the period when candles, illuminating oils, and lubricating greases were major outlets for fats and oils, but shall begin with the last quarter of the nineteenth century, when petroleum products had already largely supplanted fats and oils in these uses. Margarine provides the first example, in this period, of a large-scale substitution of fats of one type for those of another. In making margarine, various slaughter fats and vegetable oils are substituted for milk fat.

Margarine, invented in France in 1870, is, like butter, an emulsion of fat and water. In producing margarine, fat is emulsified with water or milk at a temperature high enough to keep the fat globules liquid, and the emulsion is chilled. This produces lumps or flakes of a solid water-in-fat emulsion resembling butter.

At first the principal fat used in margarine was oleo oil, which is derived from high-quality tallow. Later oleo oil was supplemented by a specially prepared form of lard.

Also, it was found that margarine could be made from mixtures of vegetable oils and tallow, or vegetable oils and oleostearine, which is a very hard fat derived from high-quality tallow. The chief difficulty in using vegetable oils in the early years was that methods of refining and deodorization had

not been well developed. Cottonseed oil could be used only in small proportions until 1900, when a great advance in refining techniques was made in the United States. From then on, vegetable oils became increasingly important as ingredients of margarine.

Beginning about 1914, deodorized coconut oil was used in margarine in increasing amounts. Coconut and other lauric-acid oils are somewhat more brittle than oleo oil, but their plastic range can be extended by the addition of relatively small amounts of liquid oil, on the one hand, and oleostearine, high-grade edible tallow, or hydrogenated oil on the other. By the mid-1920's margarine, with coconut oil as the chief constituent, dominated the United States market.

Another major way in which fats and oils of one type were substituted for those of another was the manufacture of "lard compounds," in which vegetable oils partly replaced lard. Lard compounds were an American invention. They were developed in the last 25 years of the nineteenth century as a means of using surpluses of cottonseed oil. At first, cottonseed oil was merely used as an adulterant of lard. Since lard becomes too soft when mixed with cottonseed oil only, it was necessary also to add a small proportion of oleostearine. Later, compounds of cottonseed oil and oleostearine alone were sold as lard substitutes. Mixtures of cottonseed oil and edible tallow were also developed. By 1900, full interchangeability of vegetable oils and animal fats was achieved by making "lard compound" from cottonseed oil and cottonseed-oil stearine. When cottonseed oil, as well as most other liquid oils, is chilled and allowed to stand, the stearine fraction becomes solid, settles, and can be separated by filtration.

The use of mayonnaise and salad dressings as a substitute for butter has been increasing markedly in the United States in the past ten years. Mayonnaise and salad dressings are mixtures of liquid vegetable oils, egg yolks, cornstarch, vinegar, and spices. This mixture has a plastic consistency; it is softer than butter but is not "runny."

In some countries—notably Germany—refined coconut oil is packaged and sold directly to consumers as a cooking fat and so competes directly with lard, margarine, and other cooking fats. This product is practical, however, only in climates where the temperature remains below the melting point of coconut oil.

Hydrogenation. The possibilities for interchangeability among fats and oils were greatly increased early in the twentieth century by the development of a commercially feasible process for hydrogenating fats and oils. This process adds hydrogen to the unsaturated fatty acids in the fat molecule, thus reducing the proportion of unsaturated fatty acids and increasing the proportion of saturated fatty acids. As a result, any liquid fat can be converted into a solid fat, and solid fats that are softer than desired can be hardened. The process can be fairly closely controlled to produce any desired degree of hardening.

Hydrogenation also can be used to reduce the degree of unsaturation in the more highly unsaturated oils. This makes the oil less easily oxidized and less apt to become rancid. This aspect of hydrogenation is particularly important in converting soybean and whale oils into fats suitable for margarine and "shortening." In addition, hydrogenation has a bleaching effect.

Hydrogenation was first applied to fats and oils in the United Kingdom in 1906. A landmark in the United States fats and oils industry was established in 1911 when a product made exclusively of hydrogenated cottonseed oil was successfully put on the market. This was a new form of lard substitute and, along with "lard compounds," has come to be called "shortening."[2] Since these first steps in the use of hydrogenation, the history of interchangeability among fats and oils has been largely one of exploitation of the possibilities of hydrogenation and improvements in the techniques of using it. Improved methods in refining, deodorizing, and bleaching have also helped to increase interchangeability.

Findings indicate that a shortening made by hydrogenating a single vegetable oil is superior for the production of many baked goods. There has been a steady increase in the United States in consumers' preference for this type of shortening. Control over the hydrogenation process gives a high degree of standardization in the product. This alone is a competitive advantage over ordinary commercial lard, which is variable in quality and in its behavior in baked goods. Also techniques have been worked out for varying the hydrogenating process to obtain just the qualities desired for various purposes.

[2] Shortening and "lard compounds," unlike margarine, are not an emulsion of fat and water.

In 1913, the first year for which data are available on the fats used by the shortening industry, cottonseed oil already accounted for over 90 percent of the total. Since most shortenings were then still being made from mixtures of animal and vegetable fats, a large part of this cottonseed oil undoubtedly was being used in unhydrogenated form in mixtures with oleostearine or edible tallow. Through the years, vegetable oils have continued to predominate heavily over animal fats as ingredients of shortening. The major change in materials used in shortening has been a substantial shift during the past 15 years from cottonseed to soybean oil. This shift reflects a great expansion in soybean production in the United States and an increase in demand for cottonseed oil from the margarine industry. In very recent years, lard has reappeared as a fat of some importance in the shortening industry. This has been due to the application to lard of some of the methods that have long been used for vegetable oils.

The United Kingdom is the only European country which produces substantial quantities of shortening. In addition to cottonseed oil, large quantities of groundnut and whale oils were used before the war in shortening in the United Kingdom, reflecting the availability of large supplies of groundnuts from India and Africa and of whale oil produced by the United Kingdom whaling fleet in the Antarctic. Since the war, groundnut oil has declined in relative importance and has been supplemented by palm and palm-kernel oils of African origin and sunflower oil from Argentina.

Hydrogenated oils were not extensively used for margarine in the United States until the mid-1930's. Enactment in the early 1930's of State laws taxing margarine containing coconut and other oils of foreign origin, and of Federal legislation in 1934 imposing a processing tax on coconut oil, led to a rapid shift from coconut oil to hydrogenated cottonseed and soybean oils as the principal fats in margarine manufacture. Up to this time it had not been recognized in the United States that a suitable fat for margarine could be obtained by hydrogenating vegetable oils. Later experience has shown, however, that hydrogenated oils are even superior to natural fats, producing a margarine with a greater plastic range, better keeping qualities, improved flavor, and greater uniformity.

Hydrogenation was used sooner by European margarine manufacturers than by those in the United States. Hydrogenated cottonseed, soybean, and groundnut oils were used in Europe on a large scale in the 1920's and even earlier; and in the 1930's hydrogenated whale oil came into prominence in Europe as a margarine oil.

During the Second World War a new process for refining and deodorizing crude palm oil was developed, which yields a refined oil acceptable for use in margarine. This has made it possible to take advantage in margarine manufacture of increased quantities of palm oil that have been available in Western Europe since the war, and to reduce the proportion of soft oils, which have become relatively scarce.

Hydrogenation also has applications to soap manufacture. Fats like tallow and palm oil are principally required for soap, though small quantities of soft oils may be added, and 15 to 30 percent of lauric-acid oils is desirable to give quick-lathering properties. Hydrogenation has made it possible to use large quantities of whale oil, a relatively inexpensive fat, by hardening it to resemble palm oil and tallow. Also, in the United States, supplies of greases are sometimes too large in relation to those of tallow; soap manufacturers correct this by hydrogenating part of the grease they use. The bleaching and stabilizing effects of hydrogenation also contribute to the improvement of fats for soap making.

Interchangeability of oils and fats in soap is illustrated by variations among countries in the oils and fats used. In the United States, Canada, Australia, and New Zealand, where livestock production per capita is large, domestic production of tallow is also large, and tallow and greases are the major fats used in soap. European countries are in a different position; they depend largely on imported fats and this is reflected in the use of a high proportion of palm, palm-kernel, and coconut oils in soap. Price is a prime consideration in the choice of soap fats. In recent years, the availability of foreign exchange has also been a consideration in many countries.

Agricultural Production and Food Consumption in Western Europe*

The postwar recovery of agricultural production and food consumption in Western Europe has been presented in Monograph No. 10, "Agricultural Production and Food Consumption in Western Europe," published in July 1951. A statistical note giving later data was published in Foreign Agriculture, *December 1951. The present note brings the series up to date, including production estimates for 1952-53. Revisions of earlier estimates have also been included, and some of the estimates have been extended to include Spain and Yugoslavia.*

Among the hopeful features of the postwar recovery and, later, expansion of the European economy are (1) the improvement of agricultural output under the influence of increases in productivity and (2) the restoration of reasonably satisfactory and, in some cases, even favorable patterns of food consumption.

This does not mean that agricultural expansion, everywhere, was the result of increases in productivity; nor does it mean that food consumption, in all strata of the populace, has improved to satisfactory levels of total intake and qualitative composition. In fact, Europe is far from such ideal circumstances, as are most other countries of the world, in greater or lesser degree. But good progress has been made and this progress, on the average, has been considerable.

It is such *average* conditions that the estimates in tables 1 and 2 measure. Their message is rather significant. On production, we find that, with the aid of good weather in most countries and over a number of years, it has now been established on a level permanently and significantly (perhaps at one-fifth) above 1933-37. Higher yields, smaller acreages, less labor, more machinery, lower feed consumption, and higher meat and milk yields per animal—all these are the factors that make that progress in production appear as one mainly of higher levels of skill and productivity.

On food consumption, it should be noted that the average volume of food consumption as measured by energy intake has been restored to desirable levels in all West European countries. Also, it would appear that the composition of the food supply compares not unfavorably with that of prewar days. While the per capita consumption of meat in some countries (mostly heavier consumers) has not returned to prewar standards, consumption of fresh milk has gone up in a number of areas. Consumption of fruits in most countries is considerably above the prewar level. It also seems to be a fact that per capita supplies are more evenly distributed and that the differences, within each of the more well-to-do countries, between the food standard of various strata of the population have diminished. In this respect great problems remain in the poorer countries; regional household budget data, rather than overall estimates, are required to appraise this situation.

With food consumption close to prewar levels for a population 11 percent larger than before the war, Western Europe remains heavily dependent upon imports in spite of the marked increase in production. Net imports have been reduced, but they still account for between 25 and 30 percent of consumption, as compared with about one-third in prewar times.

The decrease in imports of feed grains and feed concentrates is especially striking in view of the high level of livestock production. Gross output of livestock products in 1952-53 is estimated at 114 percent of prewar, whereas net output (i.e., output excluding the quantities produced from imported feed) is estimated at 122 percent of prewar, indicating the effectiveness of efforts to become more self-sufficient in food and feed.

Increased food production through increases in agricultural productivity continues to be emphasized in most West European countries. In its Fourth Report, published in December 1952, the Organization for European Economic Cooperation reported as the adopted objective for West European agriculture in 1956-57 an increase in production to a level 17 percent above the 1951-52 level. As the OEEC recognizes, such a rate of increase would require extraordinary efforts. Indeed, it is not likely that the objective will be fully achieved. Even if it were, however, Europe would remain an important market for imported foods and feeds.

*Prepared by the European Analysis Branch, FAS.

TABLE 1.—*Western Europe: Comparison of indices of agricultural production, total and per capita*

Country	Population in thousands	Gross index[1]		Net index[2]	
		Total[3]	On per capita basis	Total[3]	On per capita basis
Austria:					
Prewar	6,760	100	100	100	100
1947–48	6,940	66	64	71	69
1948–49	6,940	72	70	75	73
1949–50	6,920	80	78	83	81
1950–51	6,920	92	90	95	93
1951–52	6,935	97	95	98	96
1952–53	6,950	101	98	102	99
Belgium:[4]					
Prewar	8,330	100	100	100	100
1947–48	8,400	83	82	99	98
1948–49	8,600	92	89	109	106
1949–50	8,625	103	99	115	111
1950–51	8,660	108	104	125	120
1951–52	8,705	107	102	121	116
1952–53	8,758	112	107	126	120
Denmark:					
Prewar	3,706	100	100	100	100
1947–48	4,170	84	75	93	83
1948–49	4,211	94	83	101	89
1949–50	4,250	108	94	113	99
1950–51	4,290	116	100	123	106
1951–52	4,325	112	96	122	105
1952–53	4,350	118	101	129	110
France:[5]					
Prewar	41,200	100	100	100	100
1947–48	40,800	84	85	87	88
1948–49	41,950	100	98	102	100
1949–50	42,300	101	98	103	100
1950–51	42,600	109	105	112	108
1951–52	42,900	104	100	107	103
1952–53	43,200	110	105	113	108
Western Germany (excl. Saar):					
Prewar	38,700	100	100	100	100
1947–48	48,100	73	59	77	62
1948–49	49,050	84	66	86	68
1949–50	49,650	97	76	97	76
1950–51	50,000	108	84	109	84
1951–52	50,470	112	86	114	87
1952–53	50,900	116	88	118	90
Greece:[6]					
Prewar	6,793	100	100	100	100
1947–48	7,730	85	75	85	75
1948–49	7,810	82	71	82	71
1949–50	7,890	106	91	106	91
1950–51	7,970	92	78	93	79
1951–52	8,050	107	90	107	90
1952–53	8,130	99	83	99	83
Ireland:					
Prewar	2,970	100	100	100	100
1947–48	3,000	84	83	87	86
1948–49	3,000	90	89	92	91
1949–50	3,000	98	97	99	98
1950–51	3,000	97	96	98	97
1951–52	3,000	97	96	99	98
1952–53	3,000	101	100	104	103
Italy:[5]					
Prewar	42,600	100	100	100	100
1947–48	45,540	92	86	92	86
1948–49	45,870	98	91	98	91
1949–50	46,120	108	100	107	99
1950–51	46,440	108	99	108	99
1951–52	46,760	118	108	118	108
1952–53	47,060	119	108	118	107
Netherlands:[4]					
Prewar	8,500	100	100	100	100
1947–48	9,600	73	65	82	73
1948–49	9,850	91	79	100	86
1949–50	10,016	108	92	118	100
1950–51	10,175	113	94	122	102
1951–52	10,325	112	92	122	100
1952–53	10,436	119	97	130	106
Norway:					
Prewar	2,880	100	100	100	100
1947–48	3,150	94	86	101	92
1948–49	3,200	102	92	107	96
1949–50	3,250	110	97	112	99
1950–51	3,280	116	102	125	110
1951–52	3,309	115	100	124	108
1952–53	3,340	116	100	124	107
Continental Portugal:[5]					
Prewar	6,750	100	100	100	100
1947–48	7,680	111	98	110	97
1948–49	7,755	103	90	101	88
1949–50	7,830	107	92	105	91
1950–51	7,905	114	97	114	97
1951–52	7,980	128	108	127	107
1952–53	8,060	112	94	112	94
Spain:[5]					
Pre-Civil War[7]	23,660	100	100	100	100
1947–48	26,600	97	86	97	86
1948–49	26,880	84	74	85	75
1949–50	27,000	88	77	89	78
1950–51	27,200	90	78	91	79
1951–52	27,400	116	100	117	101
1952–53	27,600	108	93	109	93
Sweden:					
Prewar	6,249	100	100	100	100
1947–48	6,900	104	94	105	95
1948–49	6,925	112	101	115	104
1949–50	6,986	120	107	123	110
1950–51	7,050	121	107	123	109
1951–52	7,100	116	102	118	104
1952–53	7,150	120	105	123	108
Switzerland:					
Prewar	4,170	100	100	100	100
1947–48	4,550	90	82	89	82
1948–49	4,610	99	90	102	92
1949–50	4,670	100	89	102	91
1950–51	4,715	110	97	109	96
1951–52	4,760	105	92	105	92
1952–53	4,815	113	98	112	97
Turkey:[8]					
Prewar	16,800	100	100	100	100
1947–48	20,000	100	84	99	83
1948–49	20,300	121	100	121	100
1949–50	20,690	109	89	106	86
1950–51	20,950	122	98	122	98
1951–52	21,450	148	116	148	116
1952–53	22,000	158	121	158	121
United Kingdom:					
Prewar	47,200	100	100	100	100
1947–48	49,100	94	90	118	113
1948–49	49,650	108	103	136	129
1949–50	49,900	111	105	137	130
1950–51	50,150	119	112	146	137
1951–52	50,360	120	112	146	137
1952–53	50,535	123	115	153	143
ERP area:[9]					
Prewar	243,608	100	100	100	100
1947–48	265,660	86	79	91	83
1948–49	269,721	97	88	102	92
1949–50	272,007	104	93	107	96
1950–51	274,105	110	98	115	102
1951–52	276,459	114	100	118	104
1952–53	278,684	117	102	122	107
Western Europe:[10]					
Prewar	250,468	100	100	100	100
1947–48	272,260	86	79	91	84
1948–49	276,221	95	86	99	90
1949–50	278,407	102	92	106	95
1950–51	280,355	108	96	112	100
1951–52	282,409	112	99	116	103
1952–53	284,284	114	100	119	105

Foreign Agricultural Service, March 1954.

[1] No deduction made for the value of imported feed (as part of the feed supply from which domestic livestock was produced). [2] Excluding the value of imported feed (as part of the feed supply from which domestic livestock was produced). [3] Prewar estimates of production of individual agricultural commodities are mostly official estimates and generally refer to the period 1933–34 to 1937–38; in a few cases it seemed necessary to correct for biased reporting. Postwar estimates of production of individual commodities have, in a large number of cases, been revised for underreporting in the early years. Estimates of utilization of supplies are those of the Foreign Agricultural Service. For a complete discussion of the production indices and methodology, see *Foreign Agriculture*, January 1951, or Monograph No. 10, "Agricultural Production and Food Consumption in Western Europe," published in July 1951. [4] Excluding fruit whose large crop fluctuations make inadvisable inclusion in the index. [5] Including wine. [6] Including wine and tobacco. [7] 1931–32 to 1935–36. [8] Including tobacco and cotton. [9] Excluding Luxembourg and Iceland. [10] That is, ERP area (excluding Turkey, Luxembourg, and Iceland) plus Spain.

TABLE 2.—*Western Europe: Postwar per capita food consumption levels with comparisons*[1]

[Excluding alcoholic beverages]

Country	Population	Grain as flour	Sugar refined	Potatoes	Dry legumes	Other vegetables	Fruit and nuts[2]	Meat, carcass wt.	Fish, landed wt.	Fats, fat content	Cheese	Whole milk	Eggs	Total
	1,000	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Calories per day*
Austria:														
Prewar	6,760	127	24	92	2	58	41	49	1	16	5	214	7	2,970
1947–48	6,940	139	12	128	4	52	36	27	3	10	2	109	3	2,455
1948–49	6,940	140	24	128	2	65	47	28	2	14	2	125	4	2,725
1949–50	6,920	133	24	118	1	66	45	32	2	16	3	141	4	2,770
1950–51	6,920	130	25	110	1	64	59	39	2	17	3	163	5	2,875
1951–52	6,935	127	27	109	1	60	52	42	2	17	3	171	6	2,880
1952–53	6,950	123	26	108	1	61	55	44	2	17	3	174	6	2,885
Belgium:														
Prewar	8,330	126	27	180	3	38	43	44	11	18	5	82	11	2,935
1947–48	8,400	122	28	175	3	44	76	45	16	18	4	98	11	2,930
1948–49	8,600	115	28	186	2	45	46	43	12	21	4	105	12	2,965
1949–50	8,625	114	28	180	3	51	68	41	13	21	4	105	11	2,965
1950–51	8,660	107	29	180	3	58	72	40	13	22	5	112	13	2,970
1951–52	8,705	103	30	170	3	60	71	41	14	20	5	109	13	2,910
1952–53	8,758	101	30	164	2	62	83	44	13	21	5	107	13	2,900
Denmark:														
Prewar	3,706	97	50	119	1	68	31	78	14	24	6	175	8	3,330
1947–48	4,170	105	34	134	1	71	36	64	14	15	10	186	12	3,030
1948–49	4,211	103	38	140	1	84	64	67	19	18	9	177	10	3,190
1949–50	4,250	102	40	135	1	72	48	68	24	19	7	178	10	3,170
1950–51	4,290	100	42	140	1	74	62	54	19	21	7	172	10	3,125
1951–52	4,325	99	45	139	1	71	62	53	21	21	6	176	8	3,155
1952–53	4,350	95	46	137	1	69	65	55	17	22	8	166	9	3,195
France:[3]														
Prewar	41,200	126	24	134	6	100	32	58	9	16	6	92	9	2,955
1947–48	40,800	125	15	154	5	97	37	52	9	12	5	78	9	2,600
1948–49	41,950	131	21	143	4	100	38	56	10	14	6	92	9	2,875
1949–50	42,300	126	22	138	4	95	40	57	8	14	6	97	10	2,880
1950–51	42,600	126	25	139	4	98	46	55	9	15	6	102	10	2,935
1951–52	42,900	125	25	136	4	97	43	57	9	15	6	97	10	2,935
1952–53	43,200	123	24	134	4	96	51	59	9	15	6	100	10	2,930
Western Germany:[4]														
Prewar	38,700	108	24	181	2	48	46	48	13	23	4	136	7	2,985
1947–48	48,100	140	15	185	3	51	46	20	12	7	3	75	3	2,375
1948–49	49,050	134	20	237	3	62	38	24	16	10	3	79	4	2,655
1949–50	49,650	124	23	209	2	48	55	31	13	16	4	102	5	2,780
1950–51	50,000	107	26	192	2	54	74	37	11	21	5	118	7	2,710
1951–52	50,470	106	27	181	2	46	56	37	12	21	5	122	8	2,835
1952–53	50,900	104	25	176	2	43	73	40	12	23	5	127	8	2,900
Greece:														
Prewar	6,793	154	10	14	12	71	47	20	10	17	9	40	4	2,500
1947–48	7,730	153	8	30	11	67	57	14	8	14	6	37	3	2,415
1948–49	7,810	156	10	34	11	81	59	15	10	14	6	43	3	2,475
1949–50	7,890	153	9	41	10	90	63	16	11	15	6	48	3	2,510
1950–51	7,970	153	10	36	9	94	62	15	12	15	6	50	3	2,500
1951–52	8,050	154	10	39	11	99	63	14	14	15	7	41	3	2,530
1952–53	8,130	154	10	42	10	96	71	15	12	15	7	39	3	2,530
Ireland:														
Prewar	2,970	135	38	197	1	57	30	52	5	14	(5)	152	15	3,250
1947–48	3,000	136	32	212	1	57	33	52	6	16	1	173	12	3,255
1948–49	3,000	137	35	197	1	55	34	52	7	16	1	175	13	3,265
1949–50	3,000	133	37	188	1	53	38	53	7	17	1	182	13	3,300
1950–51	3,000	133	39	184	1	59	43	54	7	17	1	191	14	3,355
1951–52	3,000	133	41	182	1	57	33	52	7	18	1	188	13	3,345
1952–53	3,000	132	41	180	1	59	43	54	7	18	1	188	12	3,350
Italy:														
Prewar	42,600	168	7	36	12	67	52	19	8	11	5	37	7	2,560
1947–48	45,540	164	7	39	11	76	60	14	8	9	4	41	5	2,435
1948–49	45,870	171	10	41	12	72	48	16	8	10	5	49	6	2,565
1949–50	46,120	170	10	36	11	72	52	18	8	10	5	50	6	2,575
1950–51	46,440	168	11	35	11	74	58	17	9	10	5	50	7	2,585
1951–52	46,760	165	13	40	11	74	67	17	9	11	6	54	7	2,620
1952–53	47,060	164	14	38	10	72	70	19	10	11	7	55	7	2,650
Netherlands:														
Prewar	8,500	102	34	130	3	60	56	40	11	21	7	145	9	2,920
1947–48	9,600	116	30	163	3	43	43	23	15	18	5	146	4	2,765
1948–49	9,850	99	32	183	2	55	44	24	11	20	6	173	5	2,785
1949–50	10,016	99	36	150	3	63	38	30	11	23	6	164	6	2,860
1950–51	10,175	100	33	145	3	56	52	34	14	24	6	157	5	2,890
1951–52	10,325	100	34	143	3	50	46	31	13	24	6	145	4	2,850
1952–53	10,436	95	34	140	3	47	53	34	11	25	7	141	6	2,880
Norway:														
Prewar	2,880	104	33	117	2	31	35	40	38	22	8	184	7	2,970
1947–48	3,150	122	22	119	1	36	24	29	48	20	4	225	4	2,890
1948–49	3,200	120	24	130	2	50	31	29	48	22	6	231	5	3,040
1949–50	3,250	111	26	120	2	29	21	34	46	22	7	234	7	3,025
1950–51	3,280	110	26	122	2	32	39	36	49	23	8	235	7	3,055
1951–52	3,309	110	26	121	2	35	40	34	49	22	9	237	7	3,035
1952–53	3,340	106	30	117	2	35	59	35	46	22	9	235	7	3,065

TABLE 2.—*Western Europe: Postwar per capita food consumption levels with comparisons*[1]—Continued

[Excluding alcoholic beverages]

Country	Population	Grain as flour	Sugar refined	Potatoes	Dry legumes	Other vegetables	Fruit and nuts[2]	Meat, carcass wt.	Fish, landed wt.	Fats, fat content	Cheese	Whole milk	Eggs	Total
	1,000	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Kilograms per year*	*Calories per day*
Continental Portugal:														
Prewar	6,750	127	9	75	10	89	61	21	34	13	1	17	3	2,300
1947–48	7,680	122	11	105	10	92	59	19	33	12	1	14	2	2,300
1948–49	7,755	125	11	111	8	92	52	21	32	13	1	14	2	2,315
1949–50	7,830	124	11	96	8	93	59	20	35	13	1	15	2	2,320
1950–51	7,905	127	12	115	9	92	60	20	34	12	1	18	2	2,360
1951–52	7,980	127	12	120	9	95	65	20	33	13	1	18	2	2,405
1952–53	8,060	127	12	103	9	95	62	20	31	13	1	18	2	2,390
Spain (excl. Canary Islands):														
Pre-Civil War[3]	23,660	144	13	95	15	112	59	27	19	15	1	66	5	2,725
1947–48	26,600	123	5	77	14	99	79	22	19	13	1	55	4	2,305
1948–49	26,800	125	8	70	13	91	61	23	20	12	1	63	4	2,315
1949–50	27,000	118	7	65	13	94	63	23	20	13	1	58	4	2,250
1950–51	27,200	119	7	75	14	94	54	24	21	11	1	66	4	2,250
1951–52	27,400	129	9	88	15	97	61	26	21	14	1	68	4	2,500
1952–53	27,600	133	10	84	14	96	56	27	21	14	1	65	4	2,545
Sweden:														
Prewar	6,249	98	43	138	2	23	41	48	22	18	6	242	8	3,080
1947–48	6,900	86	42	139	1	20	37	49	26	18	7	244	11	2,970
1948–49	6,925	89	44	136	2	27	51	48	21	20	8	250	10	3,125
1949–50	6,986	86	46	129	2	26	65	52	20	21	8	250	10	3,200
1950–51	7,050	87	46	128	2	28	59	51	20	22	7	245	10	5,160
1951–52	7,100	86	45	128	2	28	63	47	20	22	8	239	10	3,120
1952–53	7,150	84	47	128	2	28	60	48	20	22	8	238	11	3,130
Switzerland:														
Prewar	4,170	115	38	89	2	72	74	48	2	15	8	254	9	3,150
1947–48	4,550	122	38	99	2	71	89	36	2	15	9	234	9	3,125
1948–49	4,610	118	35	98	2	73	92	36	2	16	10	243	9	3,095
1949–50	4,670	112	37	93	2	67	96	37	2	16	9	242	9	3,070
1950–51	4,715	110	38	89	2	76	120	41	2	17	8	236	9	3,105
1951–52	4,760	109	38	85	2	69	96	43	2	18	8	238	9	3,090
1952–53	4,815	109	38	86	2	64	113	41	2	18	8	239	9	3,115
Turkey:														
Prewar	16,800	196	[7] 9	5	9	86	37	17	4	6	3	21	3	2,480
1947–48	20,000	194	[7] 9	10	6	88	25	17	4	7	3	23	2	2,450
1948–49	20,300	196	[7] 10	14	8	94	34	18	3	7	3	24	2	2,515
1949–50	20,600	192	[7] 10	13	6	94	51	16	3	8	3	23	2	2,510
1950–51	20,950	198	[7] 11	19	8	101	37	17	4	8	3	23	2	2,555
1951–52	21,450	199	[7] 11	20	8	100	39	17	3	8	4	23	2	2,595
1952–53	22,000	199	[7] 11	26	10	103	144	17	4	9	4	24	2	2,660
United Kingdom:														
Prewar	47,200	95	[8] 49	79	3	61	58	68	21	21	4	121	11	3,075
1947–48	49,100	114	[8] 38	115	2	62	47	49	24	17	4	158	10	2,965
1948–49	49,650	115	[8] 41	123	3	80	43	46	22	19	4	164	10	3,085
1949–50	49,900	106	[8] 38	122	3	58	47	55	20	20	5	169	10	3,065
1950–51	50,150	103	[8] 39	116	3	68	44	53	20	22	5	169	11	3,080
1951–52	50,360	101	[8] 39	112	3	56	48	49	20	21	4	172	10	3,015
1952–53	50,535	99	[8] 40	110	3	59	46	56	19	20	4	171	9	3,020
Yugoslavia:														
Prewar	14,950	204	4	58	7	62	40	25	1	6	10	80	3	2,825
1950–51	16,400	191	7	33	9	52	29	25	2	7	6	74	5	2,665
1951–52	16,600	205	8	56	9	65	36	25	1	10	9	75	3	2,950
1952–53	16,900	203	6	32	7	44	30	26	1	7	7	66	2	2,735
ERP countries:[9] (Weighted average)														
Prewar	243,608	128	26	100	6	67	47	45	13	17	5	101	8	2,865
1947–48	265,660	137	20	116	5	68	45	32	14	12	4	94	6	2,620
1948–49	269,721	138	23	127	5	75	43	33	14	14	4	102	7	2,780
1949–50	272,007	132	24	118	5	68	50	37	13	16	5	108	7	2,810
1950–51	274,105	129	25	114	5	73	56	37	13	17	5	112	8	2,855
1951–52	276,459	127	26	111	5	69	54	37	13	17	5	112	8	2,835
1952–53	278,684	126	26	109	5	68	61	40	13	17	5	113	8	2,860
Western Europe:[10] (Weighted average)														
Prewar	250,468	125	26	106	6	70	49	45	14	18	5	103	8	2,880
1947–48	272,260	132	19	120	6	70	50	32	15	12	4	96	6	2,605
1948–49	276,221	132	23	130	6	76	46	33	15	14	4	103	7	2,775
1949–50	278,407	127	23	120	6	69	52	37	14	16	5	109	7	2,775
1950–51	280,355	123	24	118	6	73	57	38	14	17	5	114	8	2,820
1951–52	282,409	122	25	116	6	69	56	38	15	17	5	115	8	2,820
1952–53	284,284	120	25	113	5	68	62	40	14	18	5	116	8	2,845

Foreign Agricultural Service, March 1954.

[1] Consumption levels as implied by official FAS production estimates and foreign trade data as per official statistics where available. [2] Fruit in terms of fresh; nuts on shelled basis. [3] Excluding Saar for prewar and 1947–48; including Saar as from 1948–49. [4] Excluding Western Sectors of Berlin for prewar; including them for postwar. Excluding Saar for all years. [5] Less than 0.5 kilogram. [6] 1931–32 to 1935–36. [7] Including pekmez (a sirup usually made from grapes) in terms of sugar. [8] Including glucose in terms of sugar. [9] Excluding Luxembourg and Iceland; all above countries excluding Spain and Yugoslavia. [10] That is, all above countries excluding Turkey and Yugoslavia.

How My Country Feels About Technical Assistance

By G. L. MEHTA

The concept of technical assistance on an international scale began with a worldwide realization that peace and prosperity are not merely cause and effect but also are interdependent. World harmony and world poverty are mutually exclusive. The Second World War and the problems of its aftermath brought home wide discrepancies in living standards between countries and the menace to international stability which they constituted. The United States emerged from the war as the dominant economic factor in world affairs. She expended large sums as an emergency measure for the rehabilitation of Western Europe and Japan, with highly successful results. The problem in underdeveloped countries was, however, somewhat different. Here it was not a matter of restoring mature economies to former levels of productivity and stability, but a more fundamental problem involving areas which had never been prosperous in the Western sense, where living standards were woefully low, and where material progress of the last 200 years had left vast multitudes virtually untouched. Many of the countries in this position were new national entities, with a strong sense of the urgency of improving their economic condition. One of their fundamental tasks was to apply as extensively as possible the techniques and methods which had brought advanced countries to high levels of productivity and efficiency, where appropriate to local conditions and particularly in agriculture. The main burden of development was the responsibility of the underdeveloped countries themselves, but there was a marginal yet vital contribution which could be made by the United States and other advanced countries associated with her in the United Nations. Given the desire of highly developed countries to assist economically backward countries and the latter's urgent need for economic development, the technical assistance program is a step in the right direction. Like many great ideas and projects, technical assistance seems rather obvious in retrospect.

In a recent publication by the Food and Agriculture Organization it is observed, in reference to technical assistance, that "it may be said in fact that international aid carried out for no other purpose than for the benefit of the underdeveloped countries is the most important and perhaps the most outstanding and possibly unique constructive idea to have emerged from the confusion and disruption of the post-war period." I agree wholeheartedly with this appraisal except for the words "for no other purpose than for the benefit of the underdeveloped countries." Surely, all countries will benefit from a higher level of international trade and from a more stable political and economic situation in the world, which will result from the objectives at which technical assistance is aimed.

India has been and continues to be an important participant in the program of technical assistance, especially in cooperation with the U.S.A. Technical assistance has been received in my country since the inception of the Point Four Program, and the negotiations with the American Government in 1951 produced a formal agreement in January 1952 under which many local agricultural development schemes are being pursued on a joint Indo-American basis. United Nations agencies are providing technical advice and guidance in the fields of land reclamation, animal husbandry, farm machinery, forestry, and fisheries. Similar work is being performed by the Rockefeller and Ford Foundations, as also under the Colombo Plan. India is a fruitful ground for technical assistance in the fields mentioned, which is acting as a catalyst to the progress of our own economic development plans. However, I feel that the term "technical assistance" does not adequately describe the nature of the projects which are now contributing so much to the advance of Indian agriculture. We should prefer the term "technical cooperation," which fully emphasizes the point that these projects are the result of joint Indo-

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American effort. In the 2 years 1951-52 and 1952-53, the total aid given by the United States under the U. S. Technical Cooperation Assistance Program amounted to $87.78 million. Authorization for the current financial year amounts to $77.1 million. These are substantial amounts but I should like to point out that the bulk of expenditure on the various projects which have been launched under the Agreement will be borne by the Government of India. What makes the scheme so eminently worthy of the description "cooperative" is the fact that the immediate beneficiaries, the people of the area concerned, are contributing labor and materials to the utmost of their capacity. . . . Certainly, this is the most favorable basis for the utilization of assistance from abroad. The critics of the United States foreign aid program have asserted that a certain resentment, based no doubt on a sense of dependence or obligation, is sometimes detected among recipients of foreign aid. Whether this psychological phenomenon actually occurs and whether it is of any great significance I do not know. But I do know that it does not and cannot occur among the people of India. The contribution of the United States is important and valuable for the success of the projects, but it is supplementary to the people's own efforts and there is consequently no danger to their self-respect or to their incentive to self-help.

The projects under the 1952 agreement are an integral part of our current Five Year Plan. Over 17 percent of the $4.3 billion of expenditure under the Plan is for improvement of agriculture. Cash crops such as cotton and jute are our principal foreign exchange earners, but of much more importance are the staple food crops—wheat, rice, and millets, for the provision of an adequate diet for our 360 million people.

India is still a net importer of food and the nutritive intake of the bulk of India's population is still substandard. The major emphasis of the Five Year Plan is therefore inevitably on agriculture. We cannot hope to build up a sound industrial structure in a country like ours except on the basis of agricultural well-being. It involves the provision of water to arid regions, increasing the availability of fertilizers, soil erosion control, better seeds, and also the improvement of the whole environment of the peasant's life. The opportunities for the appli-

From such community workers as the extension man, the technical assistance program gets much cooperation in helping India's farmers to become more efficient.

cation of technical assistance are manifold. Already the construction of 2,650 tube wells in the Gangetic Plain is under way as part of the program of the 1952 agreement. United States technical assistance is coordinated with our own Community Development Program and National Extension Service, which are aimed to elevate 120,000 villages, covering roughly one-fourth of the rural population. These programs lie at the very heart of our Plan for overall economic progress. They include land reclamation, small irrigation works, improved marketing and credit institutions, communications, employment schemes for landless laborers, housing and community building and park construction, training of technical and administrative staff, and social welfare.

For instance, the latest report on India's Five Year Plan states that one villager out of every eight is receiving attention either under the Community Program or under the National Extension Service. Also, over 47,000 villages with a rural population exceeding 37 millions have been covered so far.

We cannot expect technical assistance to solve all our problems. Some problems we have in common with the United States and the experience of American agriculturalists can be most useful. For example, techniques and methods of the agricultural extension program are capable of adaptation to India. . . . They are being worked out in several villages day after day all over the country. Similarly, soil erosion is probably as serious a difficulty in India as it is in the United States. The Five Year Plan includes our first concerted effort for the preservation of the soil, our major source of wealth, and we seek the expert advice of American soil conservation technicians. However, our economy is such that there are basic problems requiring special study and the resources of a national government for their solution. The reorganization of land ownership and control to eliminate indebtedness and exploitation of the farmers is one of these. Another is of psychological origin and can be attacked only by government publicity and persuasion. I refer to the state of mind which gives manual labor an inferior status. Our economy cannot absorb a large proportion of administrative and service occupations without sacrificing efficiency and productivity. Here in the United States, the social virtue of labor lies in its usefulness and no honest labor is stigmatized because it is physically demanding or because it involves soiling the hands. Unfortunately, we have not yet reached this realistic and democratic attitude in India and there is some difficulty attached to the reconciliation of education and the needs of the economy.

However, the field for technical assistance is broad. It involves intensive study of local conditions and problems, and projects flexible enough to be adaptable to particular needs. We must avoid the idea, for instance, of mechanization as a panacea for our economic ills. The introduction of farm or industrial machinery must be made carefully with an eye to avoiding the addition of technological unemployment to other kinds of unemployment. The objectives of increasing productivity and maintaining employment are not wholly incompatible, especially in an expanding economy, but care must be taken to prevent imbalance where labor is not sufficiently mobile to adjust itself to rapid and extensive change in the structure of agriculture and industry.

A useful expression of cooperative action to widen knowledge and experience is the exchange of farmer delegates under the joint auspices of the International Farm Youth Exchange, the 4-H Foundation, and the Ford Foundation. Last year, 30 young Indian farmers were brought to the United States and 10 American student farmers went to India to live in rural surroundings and study agricultural problems. I had the pleasure of meeting these young Indian and American farmers both here and in Kansas City, Missouri, and was impressed by their grasp, receptivity, and outlook. Technical assistance has been received enthusiastically and gratefully by the farmers of India. They see in it the chance to lift Indian agriculture out of the archaic and inefficient ways which are still too prevalent. . . . For a long time there has been a mistaken concept that agriculture in countries such as India is stagnant and unprogressive because of the sheer inertia of the cultivators who are said to prefer the ways of their ancestors and to resist innovation and change. Even if there is an element of truth in this, it is a gross oversimplification. The Indian farmer knows very well that his output and efficiency could be improved with modern methods and would like nothing better than to be able to learn them and apply them. The Government of India has long fostered the advancement of agricultural science, and our research institutes can stand comparison with those in advanced countries. But our resources have been too

small to permit application of the research to more than a small sector. Even if the rural population were generally literate and able to benefit from government publicity of improved methods, the results could not be widespread unless there were some way of providing them with needed materials and equipment free of charge. The typical farmer simply has no margin of income to invest in tube wells, tractors, buildings, or even fertilizer. His annual income is meager and most of that is real income (produce) rather than cash. He is obliged to retain his existing system of cultivation with which he is at least familiar and which does not involve any extra investment.

All this has relevance to technical assistance. It is not just a matter of mechanizing agriculture and introducing Western methods wholesale. If you do that, there is a danger of the costs of production in agriculture rising at a faster rate than the output. The objective should be to increase output without appreciably increasing costs; in other words, to increase not merely production but also *productivity*. Thus, the answer is not so much in machinery, expensive to run and maintain, or in new processes involving expenditure on chemicals and equipment; but rather in demonstrating better methods with existing resources. It is, of course, not possible to rely exclusively on improvements at no cost or at low cost; there are some projects which have to be undertaken even if they are costly. In our Five Year Plan, we are spending $750 million on various forms of agricultural reorganization and development. A large fertilizer factory is in operation, several river valley projects and hydro-electric schemes are under way, and land reclamation and soil erosion control have a high priority. The $750 million, which is only 17 percent of the total cost of the whole Five Year Plan, must come mostly from internal resources. . . . We cannot avoid a certain amount of forced saving through a higher price level. But the large government expenditures have been carefully allocated with a view to an immediate and rapid rise in agricultural output.

For the reasons I have mentioned it is essential that our outlays on agriculture should have speedy results. Production increases delayed for 10 years would not do us much good then. Inflation and food shortages would have taken their toll.

You will, therefore, see how important are the efforts to increase production at the village level. There the results are likely to be immediate. The Technical Cooperation Agreement projects, although less spectacular, are just as important as any of the huge irrigation schemes which will bring their full fruits after some years. The latter are essential for continued progress at an ever-increasing rate after our immediate crisis has been overcome; the former are helping give us the needed margin of food output over immediate needs without which progress in any sphere is impossible.

We are, indeed, running a desperate race against time in India. I wish I could tell you that our food problems are over, that we never need again face the threat of famine. Although great strides have been made over the past 2 or 3 years, and the goal of self-sufficiency in food is now in sight, most of our energies must still be bent towards the improvement of agriculture. Our population increases by 4 or 5 million a year and even maintaining existing consumption levels implies continuing increase in food grain output by several million tons a year.

To sum up: technical assistance is one of the most important constructive methods evolved in the sphere of international cooperation. It is a technique for developing the latent resources of an economically backward country, of mobilizing its energies, and of steadily raising its standards of living. It must, however, be selective in its scope and discriminate in its application. We could have too many technical experts or not enough of the right type. While technical experts themselves must be inspired by a spirit of service and intellectual humility in a strange land, the people of the country should not have a sense of inferiority about receiving such technical advice and guidance as they can obtain nor entertain suspicion about the motives and objectives of such programs. For this reason, the main burden, both in finance and in manpower, should be on the recipient country. The program should be worked out principally by the people of the country concerned and also operated by them. Too much reliance on foreign help even in the technical sphere is likely to sap initiative and enterprise of the people themselves. But if we ourselves are aware of the magnitude of our problems and visualize the ways in which they should be tackled, then we should wholeheartedly welcome knowledge and experience from elsewhere. In other words, technical assistance like other vital programs must be cooperative in its endeavor. After all, it is true of nations as of individuals that God helps those who help themselves.

Cloves, The Mainstay of Zanzibar's Agriculture

From Zanzibar comes most of the United States supply of cloves.

By G. E. TIDBURY

Anyone who has been to Zanzibar remembers the fragrance of cloves that rises from the islands. This fragrance, intangible though it is, emanates from something quite substantial—from an industry that supplies most of the world's cloves.

The two islands Zanzibar and Pemba lie just off the east coast of Africa and, administratively, comprise the Zanzibar Protectorate. Together, they have carved out for themselves a secure corner in this important world wide trade.

Introduced from the Far East by way of Mauritius in the early years of the 19th century, cloves were widely planted in the Protectorate by order of the Sultan, Seyyid Said bin Sultan, and today in both islands there are more than 3½ million trees producing an average annual crop of nearly 10,000 tons of dried cloves plus clove oil, which is distilled from the flower stalks upon which the cloves are borne. The crop is an erratic one, however, and yields vary from nearly 20,000 tons in an occasional bumper year to about a fifth of that amount in a poor one.

Cloves are used mainly as an ingredient of Javanese cigarettes, as a spice in Eastern countries especially India, and, in occidental lands, for the preparation of vanillin and similar substances for perfumery and for flavoring.

The crop has seen vicissitudes, such as the severe hurricane of 1872, and is at present threatened by certain plant diseases. These diseases are not new—the more serious one was well known to be doing damage in the 19th century—but are not to be neglected and have consequently been the subject of scientific investigation for some years. One serious disease, called die-back, is caused by a fungus that enters the tissues when branches are broken by clumsy harvesters. This disease is controllable by careful harvesting and by pruning out diseased branches. The cause of the second serious disease, known somewhat dramatically as sudden-death, is less clearly understood but may well be connected with a fungal pathogen also. The local Department of Agriculture is engaged on long-term experiments aimed at controlling the spread of the disease and establishing healthy plantations on infected land.

Nevertheless the clove trade in Zanzibar is active and healthy. Zanzibar farmers have unbounded confidence in the clove tree and continue to plant up all available land that is suitable with the crop that made their grandfathers' fortunes and, in recent years, has enjoyed a seller's market.

The 1950-51 crop was a very large one—a record in Pemba Island—and, as is always the case in the year following a bumper crop, the 1951-52 crop was small. The current crop is another bumper one. It is expected that clove production in Zanzibar will for many more years be the mainstay of the Protectorate's economy although the methods of farming need in some respects to be modernized and become more intensive and scientific.

Zanzibar's other main crop is the coconut—a most valuable second string. Coconuts, with their marketable products of copra, coconut oil, soap, cattle feed, and fiber, have been called the "consols of the East," so dependable, if unspectacular, a source of economic stability do they represent. Zanzibar has some 5 million palms or more and produces about 12,000 tons of copra each year. Depending on the relative overseas prices of copra and coconut oil and cake, part or all of this copra is crushed locally.

Perhaps the most interesting feature of the coconut trade in Zanzibar at the present time is the recent recognition by scientific workers of a pest of the palm that has limited nut yields for many years. Research workers are confident that this pest is controllable and investigations are now in progress. Success in this sphere will be a fine fillip to the copra trade and will, furthermore, benefit the neighboring East African territories where this pest also existed unrecognized, for many years.

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Beyond these two main crops, Zanzibar has no other large source of economic wealth. Cloves and coconuts provide nearly 98 percent of the value of the Protectorate's exports. Beyond a little lime production, Zanzibar has no mineral wealth. It has a valuable tourist trade—for the islands are a holiday-maker's paradise—and a number of useful minor industries, but the economic load would be more secure if it could be spread on a few more supports as reliable as cloves and coconuts. To this end the local Department of Agriculture has for some years endeavored to popularize a number of other crops.

Crops that have caught on and are already bringing in a modest but useful quota are chillies, the tiny but extremely pungent red peppers; fresh fruit, notably oranges and pineapples sent to markets in East Africa; tobacco, a rather noisome variety that goes to Somalia for chewing; and kapok.

During the past 7 years the Department of Agriculture has been investigating the possibilities of establishing a small cocoa industry. Cacao seedlings of a high quality Criollo type have been established on Government land and others have been distributed free to a few plantation owners. There is no likelihood, however, of Zanzibar's ever supplying more than an extremely small fraction of the world's need.

Another new crop that a few farmers are growing with profit is derris root. It grows well in Zanzibar and fetches a good price.

Other crops to which Zanzibar looks for future development are limes for lime oil production, such citrus fruits as grapefruit and mandarins, and, although still in the experimental stage and only representing remote possibilities at present, cotton, and ylang-ylang oil.

Zanzibar already produces much of its own food; large quantities of rice, cassava, sweetpotatoes, sorghum, and pulses are grown for local consumption. Rice production in particular is being fostered, for the Zanzibari is a rice eater. There is, however, much to be done in the sphere of local food production, and Zanzibar agronomists are busy with investigations into the use of imported varieties and other means of increasing output.

Animals do not play so large a part as is desirable in the Protectorate's agriculture. There is a need for more milk in the towns, and most of the meat consumed is imported from Tanganyika. Notable features, therefore, of the activities of the local Department of Agriculture are the stock farm on the main experiment station at Kizimbani, where selected local Zebu-type cattle are being bred for increased milk production, and a beef ranching project on some of the hitherto valueless plains of thin soil that overlay unweathered coral rock in the eastern and southern parts of Zanzibar Island.

Parts of these coral areas are also being utilized in some of the afforestation schemes now in operation, and it is believed that the forest resources of the Protectorate, including the mangrove forests in the numerous creeks and bays, are capable of considerable development. Another recent activity concerned with food production and economic stability is a project of investigation to promote the greater development of the fishing industry; for Zanzibar, consisting as it does of two islands in the warm Indian Ocean, sees in this Ocean a considerable source of food and trade still untapped.

Agriculture in Zanzibar has none of the modernity of younger lands. Its farmers are conservative and suspicious of novelty. The visitor who can spare time from the picturesque Arab town and the warm, sandy, bathing beaches will see a system of agriculture largely unchanged since the end of the slave trade, especially in more fertile and better-watered Pemba Island. The valleys are bright emerald green with young rice, sown, reaped, threshed, and hulled by hand; the hillsides are clothed with dark, glossy green clove trees of 40 feet and more in height. In their branches the pickers climb carefully from limb to limb and, with the aid of a crooked stick, reach out and pluck the bunches of fragrant buds. At the homesteads in the harvest season, bearded Arabs, looking like Biblical patriarchs, supervise the drying of the cloves on fiber mats or concrete platforms, where the buds lie in the hot sunshine for 4 or 5 days until they are crisp and dry and ready for bagging and marketing.

In this ancient scene the tractor is a novelty and a seed drill unheard-of. But that is not to say that there are no signs of progress. A small but influential group of Arab landowners is looking more to the future. The tractor and disk plow are at work in a few rice valleys, a few clove tree owners are attempting to control the dieback disease by careful harvesting, a few planters are risking land and money in kapok or limes or pineapples, and the generation now growing up is better educated and better able to learn about agricultural developments in other lands and to think about the potentialities of its own small but fertile land.

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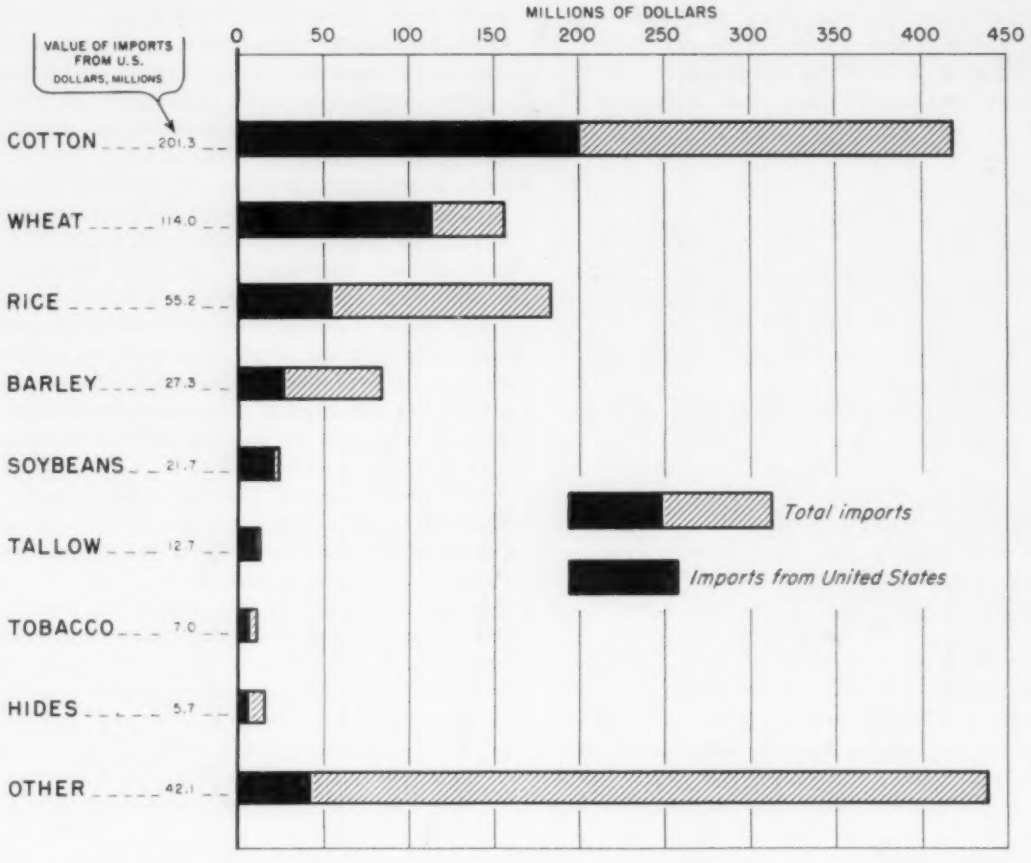

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